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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/592,959

09/15/2006

Hideharu Takezawa

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EXAMINER

NYTKO-LUTZ, EMILY

ART UNIT

PAPER NUMBER

4133

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/592,959	<b>Applicant(s)</b> TAKEZAWA, HIDEHARU	
	<b>Examiner</b> EMILY NYTKO-LUTZ	<b>Art Unit</b> 4133	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1 and 5-8 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1 and 5-8 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 September 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. ____.                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>20060915, 20080418</u> .                                      | 6) <input type="checkbox"/> Other: ____.                          |

## **DETAILED ACTION**

### ***Priority***

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

### ***Title***

2. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: Lithium Secondary Battery Containing Organic Peroxide in Non-aqueous Electrolyte or Negative Electrode.

### ***Abstract***

3. The abstract of the disclosure is objected to because it exceeds the maximum 150 word limit. Correction is required. See MPEP § 608.01(b).

### ***Specification***

4. The disclosure is objected to because of the following informalities:
  - The specification makes numerous references to Table 1 ([0054]/L6, [0075]/L4 & 6), but Table 1 is not included in the specification.
  - [0030]/L23: "Unless the feature of high capacity is not impaired" is not clear. Appropriate correction is required.

### ***Summary***

5. Claims 1, 5-8 are pending in the application. Claims 2-4 were cancelled in the Preliminary Amendment, filed 09/15/2006.

***Claim Objections***

6. Claims 1, 5-8 are objected to because of the following informalities: Claim language in claim 1/L11-13 is unclear. Limitations were added to claim 1, but claim language was not amended appropriately, resulting in a lack of clarity. It is unclear to state both that “at least one...includes” and that “said organic peroxide is included in said non-aqueous electrolyte”. Claims 5-8 are dependent thereon. Appropriate correction is required.

***Claim Rejections - 35 USC § 112***

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claim 5 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The scope of said claim is unclear because it is not clear if the organic peroxide is added to both the negative electrode and the electrolyte because of the language.

***Claim Rejections - 35 USC § 102/103***

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

12. Claims 1 & 6 rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Park et al. (US 2004/0048163).

Regarding claim 1, Park et al. discloses a lithium secondary battery ([0021]/L2-5, Fig. 1, Ref. 1) comprising: a positive electrode (Ref. 2) including a positive electrode active material ([0075]/L2-7); a negative electrode (Ref. 4) including a negative electrode active material ("lithium metal, a lithium-containing alloy, or a carbonaceous material that is capable of reversible intercalation/deintercalation of lithium ions" [0076]/L1-4); and a non-aqueous electrolyte ([0022]/L2-5 "electrolyte...includes a non-aqueous organic solvent"),

wherein said positive electrode active material comprises at least one lithium-containing composite oxide represented by the following general formula:  $\text{Li}_x\text{M}^1_{1-y}\text{M}^2_y\text{O}_2$  where  $\text{M}^1$  and  $\text{M}^2$  are different elements,  $\text{M}^1$  is Ni or Co,  $\text{M}^2$  is at least one selected from Ni, Co, Mn, Mg, and Al,  $1 \leq x \leq 1.05$ , and  $0 \leq y \leq 0.7$ . Specifically, in [0075]/L7 & 10-12, Park et al discloses the positive electrode active material  $\text{LiNi}_{1-x-y}\text{Co}_x\text{M}_y\text{O}_2$  where  $0 \leq x \leq 1$ ,  $0 \leq y \leq 1$ ,  $0 \leq x+y \leq 1$ , and M is a metal such as Al, Sr, Mg, or La. The range of composition stoichiometries disclosed by Park et al. for Ni or Co (i.e., 0-1) substantially overlaps the claimed ranges for  $\text{M}^1 = \text{Ni or Co}$  (i.e., 0.3-1.0). The range of compositions stoichiometries disclosed by Park et al. for Ni or Co (i.e., 0-1) or

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Al or Mg ( $0 \leq y \leq 1$ ) substantially overlaps the claimed ranges for  $M^2 = \text{Ni, Co, Mg, or Al}$  ( $0 \leq y \leq 0.7$ ). Therefore Park et al. anticipates instant claim compositions. See MPEP 2131.03.

said negative electrode active material comprises at least one selected from the group consisting of **silicon, tin, a silicon-containing alloy, and a tin-containing alloy** ([0076]/L4-6, “lithium-containing alloy may be selected from alloys of lithium and a metal selected from...Si, Sn”), and

at least one of said positive electrode, said negative electrode, and **said non-aqueous electrolyte includes an organic peroxide, wherein said organic peroxide is included in said non- aqueous electrolyte** ([0022]/L6-7),

said organic peroxide accounts for 0.1 to 5 % by weight of said non-aqueous electrolyte ([0035]/L1-3 Park et al. discloses “The organic peroxide...is added to a non-aqueous solvent in an amount of 0.001 to 10 wt % of the total amount of the electrolyte” which overlaps the claimed range.)

said organic peroxide is at least one selected from the group consisting of hydroperoxides, **dialkylperoxides, peroxy esters, diacylperoxides**, peroxyketals, and ketone peroxides. (See Park et al. [0029])

Further regarding the disclosed concentration of peroxide in the electrolyte, a 35 U.S.C. 102 /103 combination rejection is permitted if it is unclear if the reference teaches the range with “sufficient specificity.” The examiner must, in this case, provide reasons for anticipation as well as a reasoned statement regarding obviousness. Ex parte Lee, 31 USPQ2d 1105 (Bd. Pat. App. & Inter. 1993) (expanded Board).

Since initial capacity and high rate characteristics deteriorate when the organic peroxide is used in too low a weight percentage and the cycle life characteristics deteriorate when the organic peroxide is used in too high a weight percentage ([0035]/L3-8); the precise weight percentage of organic peroxide would have been considered a result effective variable by one having ordinary skill in the art at the time the invention was made. As such, without showing unexpected results, the claimed organic peroxide weight percentage cannot be considered critical. Accordingly, one of ordinary skill in the art at the time the invention was made would have optimized, by routine experimentation, the organic peroxide weight percentage in the apparatus to obtain the desired balance between capacity and rate characteristics, on the one hand, and cycle life characteristics, on the other hand (*In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980)), since it has been held that where the general conditions of the claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. (*In re Aller*, 105 USPQ 223).

Regarding claim 6, Park et al. discloses the lithium secondary battery in accordance with claim 1, wherein said negative electrode active material comprises a silicon-containing alloy ([0076]/L4-6 “The lithium containing alloy may be selected from alloys of lithium and a metal selected from...Si.”)

### ***Claim Rejections - 35 USC § 103***

13. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Park et al. (US 2004/0048163) in view of Kim et al. (US 2003/0170534).

Regarding claim 5, Park et al. discloses all the claim limitations as set forth above.

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Park et al. does not disclose the lithium secondary battery wherein said organic peroxide is included in said negative electrode. (Rather, Park et al. discloses that the organic peroxide is in the electrolyte.)

Kim et al. teaches a negative active material composition for use in a rechargeable lithium battery. **The negative active material composition includes an additive.** The additive is capable of forming a solid surface interface film on a surface of a negative electrode during charge and discharge [0007]. **The additive that is part of the negative electrode serves to form a SEI (solid electrolyte interface) film on a surface of the negative electrode** during initial charging in order to suppress gas generation and deterioration of battery performance [0014]. Such gas generation causes a swelling phenomenon which reduces battery capacity [0003] and occurs due to the reaction between the surface of the negative electrode and an electrolyte when a battery is initially charged [0013].

Park et al. discloses that **organic peroxides added to the electrolyte decompose to form a protective lithium carbonate ( $\text{Li}_2\text{CO}_3$ ) film or “coating layer” on the negative electrode.** Such a film inhibits decomposition of the electrolyte on the negative electrode during initial charge. Further, if the coating layer is stably formed on the negative electrode, decomposition of the electrolyte is inhibited after the charge/discharge cycle is repeated, and the electrode is very stable, preventing swelling of the battery during storage at an elevated temperature [0033].

Park et al. and Kim et al. are analogous prior art because both concern the formation of stabilizing coating layers on negative electrodes of lithium ion batteries.



It would have been obvious for one of ordinary skill in the art at the time the invention was made to use the organic peroxide as taught by Park et al. as an additive to the negative electrode as taught by Kim et al. in addition to the organic peroxide added to the electrolyte as taught by Park et al. for the purpose of forming a solid surface interface film on a surface of a negative electrode during charge and discharge (Kim et al., [0007]). This additive would serve the purpose of suppressing gas generation and deterioration of battery performance (Kim et al, [0014]).

14. Claims 7 & 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Park et al. (US 2004/0048163) in view of Shimamura et al. (EP 1396894).

Regarding claim 7, Park et al. discloses all the claim limitations as set forth above.

Park et al. does not disclose the lithium secondary battery wherein said silicon-containing alloy comprises: a solid solution including silicon and at least one transition metal element selected from the group consisting of Ti, Ni, Co, Fe, and Cu; or an alloy including silicon and at least one intermetallic compound selected from the group consisting of  $\text{TiSi}_2$ ,  $\text{TiSi}$ ,  $\text{CoSi}_2$ ,  $\text{CoSi}$ ,  $\text{FeSi}_2$ ,  $\text{FeSi}$ ,  $\text{NiSi}_2$ ,  $\text{NiSi}$ , and  $\text{Cu}_3\text{Si}$ .

Shimamura et al. discloses a negative electrode material for a lithium secondary battery comprising a solid phase A and a solid phase B, wherein solid phase A can be silicon, and solid phase B is an alloy containing one element from solid phase A and at least one element selected from the group consisting of Group IIA elements, transition elements, Group IIB elements, Group IIIB elements and Group IVB elements [0027]. Examples of the transition element include **Ti, Fe, Co, Ni, and Cu** [0028]. The particles of negative active material thus made include silicon and many possible intermetallics, including those exemplified in the tables:  $\text{TiSi}_2$

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(Tables 7-10),  $\text{TiSi}$  (Tables 7-8),  $\text{CoSi}$  (Tables 1-6),  $\text{CoSi}_2$  (Tables 1-10),  $\text{CuSi}_2$  (Tables 7-8), and  $\text{FeSi}_2$  (Tables 9-10). Shimamura teaches that it is known in the art to make materials from Si and intermetallic alloy phases, and that these alloy materials are resistant to particle cracking, resulting in a negative active material in which deterioration due to charge/discharge cycles is suppressed [0031].

Regarding claim 8, Shimamura discloses a lithium secondary battery in which  $\text{TiSi}_2$  is used as a negative electrode material ([0064]-[0068]). The use of  $\text{TiSi}_2$  is beneficial because  $\text{TiSi}_2$  has a high electronic conductivity [0067].

Park et al. and Shimamura et al. are analogous prior art because both concern materials for lithium secondary batteries.

It would have been obvious for one of ordinary skill in the art at the time the invention was made to use the negative electrode active materials as taught by Shimamura et al. in the lithium secondary battery as taught by Park et al. for the purpose of forming a negative active material in which deterioration due to charge/discharge cycles is suppressed (Shimamura et al. [0031]).  $\text{TiSi}_2$ , specifically, further, is beneficial to use because the material has a high electronic conductivity (Shimamura et al. [0067]).

### ***Conclusion***

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to EMILY NYTKO-LUTZ whose telephone number is (571) 270-1183. The examiner can normally be reached on Monday - Thursday, 7:30 AM to 5:00 PM, alternate Fridays 7:30 AM to 4:00 PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Basia Ridley can be reached on (571) 272-1453. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/EAN/

/Barbara L. Gilliam/

Supervisory Patent Examiner, Art Unit 4133